



**Date:** May 2, 2017

**From:** Walter Remmert, Director  
Bureau of Ride and Measurement Standards  
Pennsylvania Department of Agriculture

**Subject:** **Investigative Report**  
**Amusement Ride Reopening Requirements**  
**Amusement Ride: *Rollo Coaster***  
**PA Ride ID Number: 1209**  
**7 PA Code § 139.11(c)(2)**

## **I. Overview.**

The Pennsylvania Department of Agriculture (the “Department”) is responsible for oversight of amusement rides and attractions throughout Pennsylvania, in accordance with the Amusement Ride Inspection Act.

The subject of this investigative report is the *Rollo Coaster* (the “Coaster”) – a roller coaster amusement ride that is located at Idlewild and SoakZone (the “Park”), in Ligonier, Pennsylvania. The Coaster is registered with the Department and has been assigned PA Ride ID Number 1209.

The investigation described in this report was prompted by an incident that occurred on August 11, 2016. A three-year-old child (the “Subject Rider”) was ejected from the Coaster while the Coaster was in normal operation. The Department’s Quality Assurance Supervisor and an additional Quality Assurance Inspector responded to the scene on that date and initiated the on-site investigation described in this report.

The Park closed the Coaster immediately after the accident, as required by the Amusement Ride Inspection Act (at 4 P.S. § 407(d)). The Coaster has remained closed since.

This report determines the circumstances under which the Department will approve the Coaster to reopen. (See: 7 Pa. Code § 139.11(c)(2)). *It does not determine or assign legal culpability.*

In summary, the Department will require four steps/actions before it will inspect the Coaster to determine whether it is approved to reopen. These are:

1. Install manufacturer-approved secondary passenger restraints (seat belts) and confirm this installation to the Department.
2. Obtain (and provide the Department) written verification under the seal of a professional engineer, confirming the following: (a) the ride or attraction is designed to carry all loads safely, and to withstand normal stresses to which it may be subjected; (b) the structural materials and construction of the ride or attraction conform to normal engineering

practices, procedures, standards and specifications; (c) data pertinent to the design, structures, and factors of safety and performance are in accordance with accepted engineering practices; and (d) the manufacturer or fabricator of the ride or attraction otherwise meets the applicable design and construction requirements of the Amusement Ride Inspection Act and its attendant regulations, and the ASTM International F-24 Committee Standards.

3. Consult with the ride manufacturer on appropriate rider heights and height-related requirements, consider adopting the minimum height requirement prescribed by the ride manufacturer for *new* roller coasters (requiring that a rider be at least 42 inches tall and that a rider under 48 inches tall be accompanied by an adult), and report the ride owner's decision as to rider heights and height-related requirements for the subject ride to the Department, in writing.
4. Provide the Department a written description of: (a) changes to operator training requirements to reduce the risk of an accident such as referenced above; and (b) an auditing function to ensure all operators are trained properly and are adhering to requirements.

The Department is aware that the Park plans to *replace* the train cars on the Coaster with *new* cars. This information was presented to the Department by Park representatives at the April 11, 2017 meeting of the Amusement Ride Safety Advisory Board. The replacement of the train cars – which would constitute a “major modification” of the Coaster – would subject the Coaster to the same Departmental review that is given a *new* amusement ride (in accordance with the regulation at 7 Pa. Code Section 139.78). As described below and in a separate cover letter, this review process will accomplish steps 1, 2 and 3 listed above. Step 4 can be accomplished outside of the referenced “major modification” review process.

## **II. Investigation.**

### **Ride Information & Conditions:**

Ride Name: Rollo Coaster	Serial #: 1P193801
Manufacturer: Philadelphia Toboggan Company (“PTC”)	PA ID #: 1209
Date of Accident: 8/11/2016	Time: approx. 12:02 p.m.
Temperature: approx. 95 degrees	Wind: 0 – 2 MPH

The Coaster is a permanently installed wooden roller coaster operating at the Park since 1938. The Coaster's two trains, consisting of three cars in each train (each car has 4 seats, 2 front and 2 back), carry riders over several hills and swooping turns before returning to the station. At the time of the subject accident, the Coaster was open to persons at least 36 inches tall, with the additional requirement that riders under 48 inches in height must be accompanied by an adult.

### Sequence of Events, Day of Incident:

1. Witness 1 boarded the Coaster with 3 children: the Subject Rider (a three-year-old male), his 7 year-old brother, and Witness 1's son. The Subject Rider was less than 48 inches tall. His height, as measured at the hospital, was 36.22 inches. The Subject Rider's brother's height was 47.6 inches. The Park's rules for the Coaster, presented in signage at the queue line entrance (photo "A"), state that an adult must accompany children under 48 inches tall. (Maximum occupancy is 2 patrons per row)

2. Per Operator 1, ZACH ZYDONIK, he first seated all riders properly and they switched seats without him noticing.

3. Witness 2, who was seated in the rear seat (2F) of car #3, stated that she saw Witness 1 switch the seat of the Subject Rider from car #2 to car #3, resulting in the Subject Rider sitting in car #3 on the side closest to the opening of car #3 for loading and unloading.

4. Operator 2, DAVID NATHANIEL, stated that he did not see the switch nor did he notice that neither the Subject Rider nor his brother were seated with an adult (as the Park's rules require for BOTH OPERATORS).

5. Neither seating arrangement would meet the Park's rule (photo "A") that requires an adult to be seated with a child between 36 inches and 48 inches tall.

6. The Park's rules for the Coaster, per signage at the queue line entrance (photo "A"), state "children sit on far side." This is interpreted as the smaller of 2 patrons in the seat must sit on the side away from the loading and unloading opening in the car. Both Operator 1 and Operator 2 failed to conform to the proper loading procedures and visual inspection requirements of seating prior to dispatching the train out of the station and over the lift.

7. The train left the station, progressed up the lift hill and continued through the ride. An automated camera photographs each car on the downward slope of the lift hill as a souvenir sales option for patrons. Photo "B" shows the Subject Rider seated in the outside seat next to his brother. The Subject Rider can be seen holding on to the stationary grab bar with both arms around the bar.



Photo "A" Entrance to Rollo Coaster

8. Witness 2 stated she did not see the Subject Rider fall out of the car in the curve. She said, "One moment he was there, the next moment he was gone."



Photo "B" Car #3: Subject Rider and brother in front

9. Witness 2 and the remaining occupants of car #3 screamed to Witness 1, in car #2, that the Subject Rider fell out of car #3.



Photo "C" Car #2: Witness 1 in rear seat

### **Investigative Timeline:**

10. The Department's Quality Assurance (QA) Supervisor, Joseph Filoromo, was notified of the incident approximately an hour after the August 11, 2016 accident occurred (1:00 p.m.) and immediately established an investigation with QA Inspectors John Humberger and Randall Arndt assisting. Research began *en route*.

11. QA Inspector John Humberger, the closest QA Inspector, was immediately dispatched to the park and arrived at approximately 2:30 p.m. to ensure that the site was secured for investigation.

12. Prior to the arrival of Department personnel, the Subject Rider was transported by Medivac helicopter to the Children's Hospital of Pittsburgh.

13. Ligonier Township Police assisting members of the Westmoreland County Office of the District Attorney ("Westmoreland DA") were on scene investigating the incident and conducted interviews of Park employees, patrons and the family members of the Subject Rider. The scene was processed by the police for evidence and photographed.

14. The Westmoreland DA and local police were still on scene when QA Inspector Humberger arrived, and remained on scene to confer with QA Supervisor Filoromo upon his arrival at 6:30 p.m. Representatives of the Park's management and security were also present during the briefing. Photos "B" and "C" were provided by the Park at the briefing.

15. The Westmoreland DA related that it would provide the Department with its report when it was finished pending a final determination if the incident involved any criminality.

16. Department personnel immediately conducted a walkthrough of the scene and began gathering information from the Park concerning the operators, training requirements, inspection documents and other related material. Staff then conducted a physical inspection of the Coaster's structure and train.

17. The Park's Safety Director, THOMAS PAOLA, assisted with the walkthrough and noted (pointed with his flashlight in photo "D") the location where evidence (forensic evidence, hair) was collected from the adjacent fence and structure (near white placard with a red "5"). The Subject Rider was found on the ground below.



Photo "D" Area adjacent coaster where Subject Rider

18. Department personnel conducted an initial inspection of the Coaster's structure by walking the track and structure.
19. At approximately 8:00 p.m., John Fussner, independent inspector for LJM & Associates, Inc. on behalf of Festival Fun Parks, LLC ("insurance investigator") arrived. Prior to ending for the day, QA Supervisor Filoromo ensured that the scene was secured by the Park.
20. The following morning (August 12, 2016), Department personnel conducted an inspection of train #2 and its 3 cars, as well as the station and each operator's working position.
21. Department personnel conducted an inspection of the entire track and the structure, identifying issues with the track, structure and supports that are noted later in this report.
22. Representatives of GMH Engineering, contractor for the Park, arrived and conducted accelerometer testing on the coaster. Department personnel observed the testing, noting how the train was loaded. Sand bags were used to represent the weight of passengers and electronic equipment to determine the speed and the manner in which gravity acted on the cars and its passengers as it progressed through the ride.
23. The testing consisted of several runs, during which Department personnel collaborated with GMH Engineering. Department personnel took several videos. Of particular relevance are videos of the train as it passed through the curve where the Subject Rider was found. Results were initially expected to be available later the same day (August 12, 2016), but ultimately were not provided to the Department until October 24, 2016.
24. After GMH Engineering completed its testing, Department personnel took several test rides from a variety of positions within the train, took video and recorded the results. First run, Filoromo sat in the front seat row 2A (car #1 front row) and QA Inspector Arndt sat in the Subject Rider's position (car #3, row 2E, outside position). Second run, QA Inspector Arndt and Supervisor Filoromo switched positions. Video recordings of both runs were taken.
25. Department staff gathered all relevant information, ensured the Park was notified that the Coaster was not to operate without the written approval of the Department, and returned to headquarters to review the information gathered.

## Observations:

26. Witness #1, the adult in charge with respect to the Subject Rider, did not adhere to the “Fun and Safety Guide” concerning occupancy and height (signage at front of Coaster).

27. Operator 1 seated 2 small children together and a third with an adult. The Subject Rider was 36 inches tall and was required to be seated with an adult AND in the inside (far) position. He was not. Three children in the party were under 48 inches tall and were required to be accompanied by an adult. Two, including the Subject Rider, were not.

28. Operator 1 did not conduct a final check of the seating arrangement prior to dispatching and did not watch the train as it passed him to verify rider requirements. Both are requirements for operating the Coaster per operator training. The operator could have stopped the train on the lift hill per operator training.

29. Operator 2 did not notice the improper seating arrangement. He also did not watch the train as it ascended the lift hill, to see that rider seating requirements were met. There is a mirror located above Operator 2 to watch the train for this purpose. This is part of his duties as listed in the operations manual for the Coaster.

30. Inspection of the track revealed noticeable movement of the track on the ledgers in the corner where the accident occurred. Additionally, several Batter Braces (angled outward and down) in this corner are loose, the bottoms of these braces are covered with foliage and dirt – presenting the appearance that the bottom of the braces had not been recently inspected.

31. A structural support cable running to the beginning of the curve in question was observed to be loose and sagging. The turnbuckle to cable is rusted with no jam nut (Photo “E”).



Photo “E” Structural restraints for track

32. Video of a trial run shows movement in the turn where the incident occurred. The video includes the insurance investigator observing as the train goes through the curve (Video – Coaster run with sandbags [1]).



**Click icon below to view video**



**Coaster run with  
sandbags (1).mp4**

33. The stationary “Grab Bar” shown below is a primary restraint. The phrase “REMAIN SEATED – HOLD ONTO BAR” is printed in large upper-case letters on the back of each car, instructing riders to grip the bar while the Coaster is in motion (Photo “I2”). There are no seat belts to act as a secondary restraint. (Photo “F”).



Photo “F” Train #2, row 2E (Subject position)

34. See photos below of GMH Engineering preparing for and conducting the accelerometer testing on August 12, 2016 (group of 4 photos, Photo “G”). The Department received the results on October 24, 2016.



Photo “G” Preparing for accelerometer test

35. Department personnel conducted test runs to determine the overall rider experience, line of sight for operators, entry/exit actions at the station, and positional point of view during the ride.

36. Photos “H” and “I,” as well as the video taken during the test runs, show the location of the operators as the train leaves the station and climbs the lift hill (Video – Coaster test run 1).

37. Operator 1 has a clear line of sight as the train passes his position. He also has clear line of sight as the train starts to climb the lift hill (Photo “H” and Photo “I”; Video – Coaster test run 1).

38. Operator 2 has clear line of sight of the dispatch area (station), the initial curve to the lift hill, and the lift hill. A mirror positioned over Operator 2’s area allows him to assist with watching the loading area. Operator 2’s area has the controls to stop the train prior to descending the lift hill, if necessary.

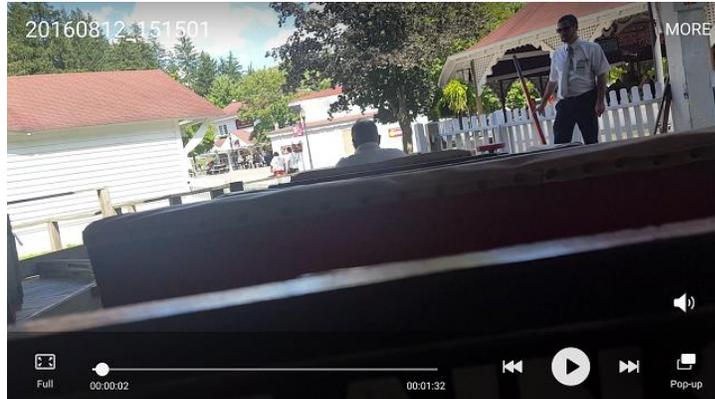


Photo "H" Rear of train looking forward at station



Photo "I" & "I2" Operator has view of loading and hill with controls to stop the train

39. The screen shot below from the video shows the location where there is a left-right movement in the car toward the end of the curve where the #5 is posted. Just in front of the #5 is the approximate location where the Subject Rider fell out (at 60 to 61 seconds in the following video - below the screen shot).



Click Icon Below to View Video



Coaster test run 1

40. A modification occurred earlier in the year where padding was installed to the existing grab bars. The original bars did not have padding. The extra thickness due to the padding makes it difficult to grasp the bar (see signage in photo "I2", which instructs riders to "REMAIN SEATED – HOLD ONTO BAR"). The "Grab Bar" is the only restraint on this ride.

41. The couplings on this type of coaster consist of three hardened bolts (two of which are vertical, with a third bolt positioned horizontally between them) that are sleeved with steel pipe that acts as a wear surface that also limits movement between the cars. The photo shows wear in the steel pipes (car #2 and car #3 of train 2). (Photo "J")



Photo "J" Coupler between car #2 and #3

42. The Park's Operations Department Training Checklist (Photo "K") is inconsistent with the conditions existing at the Park as described by Park personnel. The authorized representatives of the Park notified the Department's inspection team that the Park has not operated two trains for several years. The Department's inspection team also noted that the second train was disabled as it was not completely hitched together. Under the "Standard Operating Procedures" section of the referenced Operators Department Training Checklist, the trainers for both operators signed off that the trainer demonstrated 5 times to trainee how to run a two-coaster operation. Both trainer and trainee signed the document to attest to its veracity. This calls into question the extent to which the other training requirements were adhered to (Photo "K").

Operations Department Training Checklist		Rollo Coaster	
Team Member Name: Zach Zydoruk		Date: 7/16/16	
Please initial in the appropriate space after each item has been demonstrated and performed.			
TL	TM	Location Information	
NB	EL	Location of closest restroom	
NB	EL	Location of closest phone and important extensions: #2111 and #2222	
NB	EL	Location of First Aid Building	
NB	EL	Location of Guest Services	
Pre-opening procedures			
NA	EL	Daily Operations Report (maintenance signature, graffiti, proper documentation, etc.)	
NB	EL	Filing out Safety Checklist (go over checklist)	
NB	EL	Checking fire extinguishers	
ND	EL	Checking flashlights and closest phone as well as signs and height sticks	
NB	EL	Completing cleaning checklist (go over the checklist and location of cleaning supplies)	
NB	EL	What to do if you find something wrong when checking pre-opening procedures	
Start up procedures			
NB	EL	Checking queue line rails, and entrance/exit gates	
NB	EL	Checking warning bell and the warning light	
ND	EL	Checking the control area, track, and ride area for obstacles and debris	
ND	EL	Review the six basic loading checks for a ride to be all clear: check heights, restraints, check riders are seated properly, non-riders behind ride fence, entrance and exits closed, and give ride speech	
NB	EL	Starting up the coaster (review the brake levers)	
Standard Operating Procedures			
NB	EL	Demonstration of one coaster operation by trainer 5 times with explanation of each step in the process	
NB	EL	Running of one coaster operation by trainee 5 times	
NB	EL	Demonstration of two coaster operation by trainer 5 times with explanation of each step in the process	
NB	EL	Running of two coaster operation by trainee 5 times	
NB	EL	Ride regulations (include clothing requirements, seating, balancing, height requirements etc.)	
NB	EL	Food/drink/smoking and picture taking regulations	
NB	EL	Loose articles and what to do with valuable ones left behind	
NB	EL	Adverse weather conditions (cold temperatures, high winds, light rain, heavy rain, and lightning)	
NB	EL	Stress "Keep your eyes on the ride", and "importance of ride safe zone"	
ND	EL	Cover procedures for an equipment break down: Call the park operator (power down if you must leave the ride), wait for maintenance and your supervisor, reassure guests the ride will reopen and there is only a temporary delay in service. Wait for OK from supervisor before loading ride after a shutdown. Remember, test run	
Unusual Circumstances			
NB	EL	Check brake is not reducing the speed of incoming trains	
NB	EL	Warning bell or light malfunctions and Slow guests/Guests difficulties	
Ride Admission Policy			
NB	EL	Guests with disabilities (go over the Ride Admission Policy), especially guests in wheelchairs	
NB	EL	What to do if a guest with disabilities is waiting in line and you are not sure what to do	
Emergency Procedures			
NB	EL	Remain Calm	
NB	EL	Fire (who to call and location of fire extinguishers), Serious Incident, Power Outages	
NB	EL	Train stops on lift	
NB	EL	Train stuck on unload brake	
NB	EL	Guests delaying the train on unload brake-guest stuck or slowly departing	
NB	EL	Train is unintentionally dispatched or slips past the load brake	
NB	EL	Train stuck on check brake	
NB	EL	Train evacuation on lift or any place other than the situation	
Closing Procedures			
NB	EL	Taps and when to cut line	
NB	EL	Review lock down procedures (shutting off chain, inserting wedges in levers, locking power switch, and lights)	
NB	EL	Turning in all paperwork and writing repair requests	
Trainee Observation			
NB	EL	Running of ride by trainee 3 more times	
* I acknowledge that I have read the Amusement Operators Manual and Standard Operating Procedures for this attraction. I acknowledge that I have been trained in all of the procedures for each step listed above and feel confident in performing these duties. Team Member Signature: [Signature] Date: 7/16/16			
* I acknowledge that I have reviewed all of the procedures for each step listed above. Team Lead or Trainer Signature: [Signature] Date: 7/16/16			

Operations Department Training Checklist		Rollo Coaster	
Team Member Name: David [Signature]		Date: 7-22-16	
Please initial in the appropriate space after each item has been demonstrated and performed.			
TL	TM	Location Information	
NB	DN	Location of closest restroom	
NB	DN	Location of closest phone and important extensions: #2111 and #2222	
NB	DN	Location of First Aid Building	
NB	DN	Location of Guest Services	
Pre-opening procedures			
NB	DN	Daily Operations Report (maintenance signature, graffiti, proper documentation, etc.)	
NB	DN	Filing out Safety Checklist (go over checklist)	
NB	DN	Checking fire extinguishers	
NB	DN	Checking flashlights and closest phone as well as signs and height sticks	
NB	DN	Completing cleaning checklist (go over the checklist and location of cleaning supplies)	
NB	DN	What to do if you find something wrong when checking pre-opening procedures	
Start up procedures			
NB	DN	Checking queue line rails, and entrance/exit gates	
NB	DN	Checking warning bell and the warning light	
NB	DN	Checking the control area, track, and ride area for obstacles and debris	
NB	DN	Review the six basic loading checks for a ride to be all clear: check heights, restraints, check riders are seated properly, non-riders behind ride fence, entrance and exits closed, and give ride speech	
NB	DN	Starting up the coaster (review the brake levers)	
Standard Operating Procedures			
NB	DN	Demonstration of one coaster operation by trainer 5 times with explanation of each step in the process	
NB	DN	Running of one coaster operation by trainee 5 times	
NB	DN	Demonstration of two coaster operation by trainer 5 times with explanation of each step in the process	
NB	DN	Running of two coaster operation by trainee 5 times	
NB	DN	Ride regulations (include clothing requirements, seating, balancing, height requirements etc.)	
NB	DN	Food/drink/smoking and picture taking regulations	
NB	DN	Loose articles and what to do with valuable ones left behind	
NB	DN	Adverse weather conditions (cold temperatures, high winds, light rain, heavy rain, and lightning)	
NB	DN	Stress "Keep your eyes on the ride", and "importance of ride safe zone"	
NB	DN	Cover procedures for an equipment break down: Call the park operator (power down if you must leave the ride), wait for maintenance and your supervisor, reassure guests the ride will reopen and there is only a temporary delay in service. Wait for OK from supervisor before loading ride after a shutdown. Remember, test run	
Unusual Circumstances			
NB	DN	Check brake is not reducing the speed of incoming trains	
NB	DN	Warning bell or light malfunctions and Slow guests/Guests difficulties	
Ride Admission Policy			
NB	DN	Guests with disabilities (go over the Ride Admission Policy), especially guests in wheelchairs	
NB	DN	What to do if a guest with disabilities is waiting in line and you are not sure what to do	
Emergency Procedures			
NB	DN	Remain Calm	
NB	DN	Fire (who to call and location of fire extinguishers), Serious Incident, Power Outages	
NB	DN	Train stops on lift	
NB	DN	Train stuck on unload brake	
NB	DN	Guests delaying the train on unload brake-guest stuck or slowly departing	
NB	DN	Train is unintentionally dispatched or slips past the load brake	
NB	DN	Train stuck on check brake	
NB	DN	Train evacuation on lift or any place other than the situation	
Closing Procedures			
NB	DN	Taps and when to cut line	
NB	DN	Review lock down procedures (shutting off chain, inserting wedges in levers, locking power switch, and lights)	
NB	DN	Turning in all paperwork and writing repair requests	
Trainee Observation			
NB	DN	Running of ride by trainee 3 more times	
* I acknowledge that I have read the Amusement Operators Manual and Standard Operating Procedures for this attraction. I acknowledge that I have been trained in all of the procedures for each step listed above and feel confident in performing these duties. Team Member Signature: [Signature] Date: 7-22-16			
* I acknowledge that I have reviewed all of the procedures for each step listed above. Team Lead or Trainer Signature: [Signature] Date: 7/22/16			

Photo "K" Training certificates for Operators 1 & 2

43. Rob Enos performed a daily inspection of the Coaster’s train #2 at 9:45 a.m. on the day of incident, with no issues noted (Train #2 was the one in use at the time of the accident). Mr. Enos is certified in accordance with the Amusement Ride Inspection Act to inspect rides (such as the Coaster) on behalf of the Park. His certification (ID #877) is valid and current through March 1, 2018 (Photo “L”).

RIDE: 3 TRAIN X ROLLO COASTER DATE: 8-11-16 TIME: 9:45am

INSPECTION FREQUENCY  
CHECK LIST D-DAILY W-WEEKLY B-BIWEEKLY M-MONTHLY

		Initials
1	Inspect track and structure	D RRE
2	Inspect lift chain and anti- roll backs	D RRE
3	Inspect trains, interior, seats, and safety bars and stickers on back of seat	D RRE
4	Inspect under carriage, guide wheels, anti- roll backs, chain dogs, all bolts / pins	D RRE
5	Check the operation of all brakes	D RRE
6	Inspect couplers and safety chains	D RRE
7	Oil track and chain (as needed)	D RRE
8	Visually inspect all fencing, gates, guarding, and barricades, and secure perimeter gates	D RRE
9	Oil and grease brake lifters	W
10	Grease running and side friction wheels (or as needed)	M
11	Grease upper and lower bearings on chain incline	W
12	Grease / oil coupler and rocker panel	D RRE
13	Grease pillow block bearings in motor room, oil small drive chain in motor room	W
14	Check set screws on rocker arms of each car	D RRE
15	Check bolts and welds under back seat	D RRE
16	Inspect rear bumpers	D RRE
17	Check lighting in station for proper operation & lighting on track	D RRE
18	Check unload brake safety latch (used at night / and in safety shut down situations)	D RRE
19	Test run ride one complete operating cycle	D RRE
20	Record all repairs, adjustments, and changes	D

Rob Enos  
INSPECTOR (printed name)

COMMENTS: see reverse side of inspection form for repairs and adjustments.

Photo “L” Train #2 daily inspection

44. The track gauge measurement at the curve involved in the incident was 33 1/2” to 33 3/4”. The standard gauge noted by manufacturer requirements is 33” +/- 1/4” maximum tolerance. (See Photo “X”)

**Structural Notes:**

45. Photos “M” and “N” depict the approximate site where the incident occurred. Noted in the photos are areas of structural wear and tear, which is consistent with track movement while the Coaster is in operation as seen in the previous video (video – coaster run with sandbags 1).



Photo "M" Top rail splice pointing 'in' toward direction of travel.



Photo "N" Structural movement at site

46. Photo "O" depicts the need for regular maintenance on the sled brake assembly. Note the missing bolts at the ends of the brake bands and other hardware that require replacement and/or tightening.



Photo "O" Brake assembly

47. The turnbuckles and cables in the curve where the incident occurred are intended to provide radial stability to curves on Philadelphia Toboggan Roller Coasters. Several turnbuckles were found to be lying on the ground unattached. The cable attaching assembly is buried in vegetation and overgrown. One cable was attached to a tree.



Photo "P" Turnbuckle for incident



Photo "Q" Turnbuckle alternate view

48. A cable and turnbuckle attached to a tree sagging, rusted, and unable to be tightened.



Photo "R" Turnbuckle and cable attached to tree



Photo "S" Depicting track movement



Photo "T" Shows nail and movement

49. Video of brace bottom movement. [Click to view](#)

 Bent brace movement 1.MOV

50. Video of another brace bottom movement. [Click to view](#)

 Bent brace movement 2.MOV

51. Video of a loose brace. [Click to view](#)

 Coaster loose down brace 2.mp4

52. Video of the loose brace cleaned out and during test run. [Click to view](#)

 Bent brace movement 3.MOV

53. Video of track movement. [Click to view](#)

 Track underneath.MOV

54. Batter brace buried.



Photo "U" Buried bracing for bent

55. Batter brace cleaned showing movement.



Photo "V" Cleaned brace showing movement

56. Tape measure shows amount of movement of the track on the ledger.



Photo "W" Track movement

57. Track gauge measurement.



Photo "X" Track gauge measurement

58. Coaster train #1, which has been out of service for quite some time. Hitches can be seen unattached and no safety chain installed.



Photo "Y" Coaster train #1



Photo "Z" Train #1 hitch attachment

### III. Summary:

The following is a list of factors that (whether individually or in combination) may have contributed to a three-year-old child falling/being ejected from the *Rollo Coaster* amusement ride as it underwent normal operations at the Park on August 11, 2016:

- **Operations.** All riders were not seated properly. The Park's operator training and signage dictates that riders between 36 inches and 48 inches in height must be accompanied by an "adult." Signage states the following: "Children sit on far side." The "far side" is opposite the opening.

The Park operator's manual states:

"Loader/Front Brake Operator - Admit guests onto the ride while enforcing the ride requirements & regulations."

And

"Back Brake Operator - When the train is dispatched, observe the guests as it climbs the lift ensuring proper riding requirements." (The back brake operator said in the police interview, "That is the job of the front operator.")

The final seating arrangement was photographed during the ride and shows two children under the height of 48 inches together in the front seat of car #3, with the smaller child (the Subject Rider) with arms over the modified grab bar. The operators will require re-training per updates and changes to the Coaster.

- **Absence of secondary passenger restraints.** There are no secondary passenger restraints installed on the Coaster.
- **Modification of the original Grab Bars.** This ride was manufactured by Philadelphia Toboggan in 1938 with grab bars for the rider to grasp in order to remain secure. The park instructs every rider to “REMAIN SEATED – HOLD ONTO BAR” by prominent signage facing each rider (Photo “I2). In 2016, the Park added foam rubber padding to these grab bars. This changed the diameter of the original design such that riders of smaller stature might find it more difficult to comply with the park’s instructions to “REMAIN SEATED – HOLD ONTO BAR.”
- **Height of riders.** *New* roller coasters manufactured by Philadelphia Toboggan Company require that a rider be at least 42 inches tall and be accompanied by an adult if he/she is under 48 inches tall. The coaster at issue in this matter was erected in 1938. Going forward, while the Park may not have been required to follow these requirements on the date of the incident on the coaster at issue, the Department recommends the Park consider adopting the referenced rider height requirement.
- **Maintenance/structural considerations.** As part of its on-site investigation the Department noted several maintenance/structural conditions that it brings to the Park’s attention. The extent (if any) to which these contributed to the accident is not known and the Department offers no opinion in this regard. These conditions are as follows:
  - Worn train hitches. Wearing and deterioration of the steel pipe wear surfaces that sleeve the hardened bolts in the coupling between the cars involved in this incident allows for greater movement between the coupled cars than if the wear surfaces were completely intact. A photo of the bolts between car #2 and car #3 of train 2 shows the extent of the wear in these steel pipe wear surfaces (Photo “J”).
  - Track/wheel gauge. Philadelphia Toboggan Company advises the Department that the *track gauge* for its roller coasters should be 33.25 inches and that the *wheel gauge* for its roller coasters should be 33.” *The Rollo Coaster’s* track gauge varies up to 33.75” (as shown). Increased track gauge effects the speed and tracking of the train and can cause movement that would not otherwise be present if the track gauge was within the limits presented by the Coaster’s manufacturer, Philadelphia Toboggan Company.
  - Movement of the track and structure as shown in this report.
  - Maintain/remove dirt and debris from all footings of the Coaster to ensure the footings and connections are serviceable and to prevent structural deterioration.
  - The accelerometer testing was compared with details of the investigation by the Department. At approximately 55 and 60 seconds into the ride, in row #6, on the accelerometer test, there is a spike in lateral g-force as shown on the report. The accelerometer test results show a particular g-force spike exceeding 2 when the ride was at the approximate location of reflector #7.

- The video of the ride that the Department investigators took starts approximately 11 seconds before the Coaster begins to move. This video shows a lateral movement at approximately 101 seconds. This movement appears to coincide with the g-force spike exceeding 2 that occurred when the Coaster was at the approximate location of reflector #7.

#### **IV. Reopening Requirements.**

The Department is prepared to conduct an inspection of the Coaster to determine whether it can reopen. The following steps should be taken before the inspection occurs. As stated above, if the Park proceeds with its stated plan to replace the train on the Coaster, this major modification will be subject to review and approval that will effectively address items 1, 2 and 3 below. Step 4 can be accomplished outside of the referenced “major modification” review process.

1. Install manufacturer-approved secondary passenger restraints (seat belts) and confirm this installation to the Department.
2. Obtain (and provide the Department) written verification under the seal of a professional engineer, confirming the following: (a) the ride or attraction is designed to carry all loads safely, and to withstand normal stresses to which it may be subjected; (b) the structural materials and construction of the ride or attraction conform to normal engineering practices, procedures, standards and specifications; (c) data pertinent to the design, structures, and factors of safety and performance are in accordance with accepted engineering practices; and (d) the manufacturer or fabricator of the ride or attraction otherwise meets the applicable design and construction requirements of the Amusement Ride Inspection Act and its attendant regulations, and the ASTM International F-24 Committee Standards.
3. Consult with the ride manufacturer on appropriate rider heights and height-related requirements, consider adopting the minimum height requirement prescribed by the ride manufacturer for *new* roller coasters (requiring that a rider be at least 42 inches tall and that a rider under 48 inches tall be accompanied by an adult), and report the ride owner’s decision as to rider heights and height-related requirements for the subject ride to the Department, in writing.
4. Provide the Department a written description of: (a) changes to operator training requirements to reduce the risk of an accident such as referenced above; and (b) an auditing function to ensure all operators are trained properly and are adhering to requirements.